THE WARTIME TACTICAL AMMUNITION DISTRIBUTION SYSTEM: IS IT READY TO SUPPORT THE 21ST CENTURY BATTLEFIELD?

A MONOGRAPH
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ABSTRACT

The Wartime Tactical Ammunition Distribution System: Is it Ready to Support the 21st Century Battlefield? by Major Charles W. Kibben, USA, 43 pages.

As the army continues to reorganize in preparation for the battles of the 21st Century, logisticians seek the capabilities to sustain the weapons of modern warfare. To support the current and future ammunition requirements of the tactical commander, the Wartime Ammunition Distribution System (WTADS), has evolved to include the Maneuver Oriented Ammunition Distribution System/Palletized Loading System (MOADS/PLS) concept. Designed with the ultimate goal of providing ammunition quickly and effectively to the combat user by maximizing flexibility and mobility, the MOADS/PLS concept is now the focal point for future wartime tactical ammunition sustainment operations.

This monograph examines the question of whether the WTADS at the tactical level or the MOADS/PLS concept needs to be further changed to enhance combat effectiveness on the battlefield. The monograph identifies the structure of the tactical WTADS and defines the critical functions inherent to the tactical wartime ammunition distribution. To assess the ability of the system to meet the sustainment demands associated with modern conflict, the capabilities and limitations of ammunition sustainment functions are analyzed and compared to test evaluations to determine how well the system as currently designed, would have performed during Operation Desert Storm.

Finally, the monograph identifies proposals that could enhance the capability of the WTADS. The monograph shows that while the system has tremendous capability to support future battlefield sustainment operations, weaknesses in automation, training, and the current structure of the system do exist and could impact on the flexibility and responsiveness required to support future force projection operations. The conclusions suggest the wartime tactical ammunition distribution system must continue to evolve, change, and adapt to the combat environments the army will face in the 21st century.

CONTENTS

ABBREVIATIONS

ASA	Ammunition Support Activities
ASP	Ammunition Supply Point
ATP	Ammunition Transfer Point
BSA	Brigade Support Area
CMMC	Corps Movement Control Center
CSA	Corps Support Area
CSR	Controlled Supply Rate
DAO	Division Ammunition Officer
DS	Direct Support
DSA	Division Support Area
FSB	Forward Support Battalion
MMC	Material Management Center
MOADS/PLS	Maneuver Oriented Ammunition Distribution System/ Palletized Loading System
POD	Port of Debarkation
SAAS	Standard Army Ammunition System
STON	Short-ton
TSA	Theater Storage Activity
WTADS	Wartime Ammunition Distribution System

CHAPTER I: INTRODUCTION

"A soldier in combat can go a year without pay; months without mail; days without food, water, and sleep; but he cannot survive a minute without ammunition."[1]

LTG Joseph M. Heiser
HELFAST XVII Conference
Fall, 1986

Section 1: Background

One need only be familiar with the dynamics of building and sustaining combat power to give credence to LTG Heiser's assessment of the relative importance of ammunition during combat operations. Ammunition is the one commodity of supply that every unit in any combat situation needs. The ability to supply the correct quantities of ammunition in a timely manner on the battlefield, plays a dominant role in shaping the outcome of combat operations. To conduct decisive combat operations effectively, ammunition supply sustainment activities at the strategic and tactical levels of war must be structured functionally and be adaptive to the requirements of the user. Success on the battlefield depends ultimately on the ability of the force to generate combat power. The lack of effective or sufficient ammunition support can equate directly to diminished combat capability.

Combat operations in the post-Cold War era will emphasize the projection of overwhelming land power to deter potential regional threats in a variety of theaters of operations. Of significant importance is the ability to operate in combat environments without mature infrastructures. The possibility of operating in such austere environments suggests that sustaining the capability of the future force projection Army will be

extremely challenging. Gone is the likelihood that future combat will be characterized by long preparation times and forward force deployments. Although the Army is moving rapidly towards a more flexible, "capability based" force design, the potential combat environment is becoming equally complex.

As the US Army continues its transition from a forward deployed to a force projection force, the ammunition sustainment system has evolved. In the evolutionary process, the system has become more flexible and responsive to a broad range of varying and dynamic situations. To support fully the rapidly changing environment and advances in technological applications on the battlefield, the task of "arming the force" continues to evolve in the form of the Wartime Ammunition Distribution System (WTADS).[2]

Operating at the strategic, operational and tactical levels of war, the WTADS encompasses all ammunition sustainment functions from the CONUS base to the tactical warfighter. Given the task of providing the correct type and quantity of munitions necessary to satisfy the requirements of the power projection force, the munitions distribution system at every level of war has been modified. Modifications have served to enhance the combat effectiveness of the warfighter in a wide variety of mission profiles.

To meet the challenges associated with increasingly complexed sustainment requirements at the tactical level of war, the Army introduced the Maneuver Oriented Ammunition Distribution System/Palletized Loading System, (MOADS/PLS) concept and it's supporting doctrine.[3] Designed with the ultimate goal of providing ammunition quickly and effectively to the combat user by maximizing flexibility and mobility, the

MOADS/PLS concept is now the focal point for future wartime tactical ammunition sustainment operations.

To enhance capability and meet the ammunition requirements associated with the Force XXI Army, MOADS/PLS doctrine introduces for the first time the concept of modular sustainment.[4] Under the MOADS/PLS doctrinal concept, the organizational munitions support structure at the tactical level of war has been altered to meet requirements of a task organized forward deployed force. By matching requirements with capabilities, the modularity support concept focuses on the more efficient utilization of resources to enhance the flexibility and responsiveness of the tactical ammunition distribution system.

As the dynamics of the modern battlefield change and the Army continues to experience a reduction in resources, the ability of the WTADS to support combat operations effectively and efficiently will be challenged. To overcome these challenges, the Army must continue to evaluate the WTADS. Put in simplistic terms, the Army must have a WTADS that addresses three basic issues. First, the system must utilize efficiently all available resources. Second, the system must be capable of meeting the demands of changing environments and technology. Third, the system must adapt to the needs of the warfighter in order to enhance warfighting capability on the future battlefield.

Section 2: Purpose

The purpose of this monograph is to determine if the tactical ammunition distribution system as outlined in MOADS/PLS doctrine should be changed or modified to improve combat effectiveness on the battlefield. The primary research question to be answered is: Can the WTADS at the tactical level be changed to enhance combat effectiveness on the battlefield? To answer this question, the following subordinate questions will be answered:

1. What are the current components and functions of the tactical ammunition distribution system under the MOADS/PLS doctrinal concept?;
2. What are the limitations and capabilities of the tactical ammunition distribution system under the MOADS/PLS concept?;
3. What changes or modifications to the tactical ammunition distribution system under the MOADS/PLS concept could enhance combat effectiveness on the battlefield?

The data presented throughout this monograph is structured to question systematically the design and functions of each component of the tactical WTADS under MOADS/PLS doctrine. The conclusions will help determine if MOADS/PLS doctrine needs to be modified to improve the warfighting capability of the US Army heavy corps or division. To answer the primary and subordinate research questions effectively, the doctrinal design of the current MOADS/PLS system at the tactical level of war will be assessed using three sets of criteria. First, the assessment will determine how well the current MOADS/PLS doctrinal concept adapts to the planning considerations of supporting as far forward as possible, and maintaining total asset visibility as defined in the 1998 version

of FM 9-6.[5] Once the MOADS/PLS design has been assessed against these planning consideration, the results will be compared to the tenants of Army Operations Doctrine as defined in the 1993 version of FM 100-5.[6] This comparison will help to establish how well the current MOADS/PLS doctrine links logistics planning to operational considerations.

In Chapter II, the monograph details the structure and functions of the tactical munitions distribution system at the Army corps and division level. Focusing on the corps support area (CSA), ammunition supply point (ASP), and ammunition transfer point (ATP), the analysis will look at each organization in order to outline its current force structure under MOADS/PLS doctrine. Each organization is then detailed from a functional standpoint to assist the reader in understanding how ammunition flows on the battlefield under the MOADS/PLS doctrine concept. Chapter II also explains how each organization within the tactical WTADS functions to support the movement, survivability, management, storage and operations aspects of ammunition distribution at the tactical level of war.

Chapter III assess the limitations and capabilities of MOADS/PLS doctrine in supporting ammunition operations at the tactical level of war. The capabilities and limitations of the tactical WTADS are analyzed to determine how well current resources and management functions inherent to the MOADS/PLS concept support the ability of the tactical commander to build and sustain combat power. To assist in obtaining an accurate assessment of the capabilities and limitations of the MOADS/PLS doctrinal concept, peacetime evaluation tests pertaining to the capability of the system to generate

and sustain combat power will be reviewed. The results of this analysis will be related to the sustainment conditions and logistical considerations encountered during Desert Storm. The data comparison will serve to determine if MOADS/PLS doctrine could have improved ammunition distribution and enhanced combat capability through the responsive generation of combat power during combat operations.

Chapter IV is devoted to suggesting how the tactical munitions distribution system under the MOADS/PLS doctrinal concept can be changed or modified to enhance combat capability on the future battlefield. The analysis will recommend modifications or improvements to existing MOADS/PLS concepts. The focus is on changes or modifications that could have a positive impact on enhancing the ability of the tactical ammunition distribution system to build and sustain combat power on the future battlefield.

While the purpose of this monograph is to determine if the WTADS at the tactical level of war needs to be changed or modified to enhance combat effectiveness on the battlefield, it serves two other functions. First, by examining the ammunition distribution system at the tactical level of war in detail, this monograph gives the reader a better understanding of how the ammunition distribution system under MOADS/PLS doctrine is supposed to work. Second, the monograph serves to suggest ways to improve tactical ammunition sustainment operations to enhance warfighting capability and improve tactical ammunition sustainment operations for the 21st century battlefield.

CHAPTER II: STRUCTURE AND FUNCTIONS

"The Army's ability to meet its force projection requirements calls for highly mobile, multifunctional organizations capable of projecting munitions support anywhere in the world."[7]

FM 9-6
Munitions Support in the Theater of Operations
March, 1998

Section 1: Introduction

Ammunition sustainment support at the tactical level of war is inherently concerned with ensuring the tactical commander has the capability to fight and win battles and engagements over a broad spectrum of environments. Successful tactical ammunition support operations focus on providing the right type and quantity of ammunition to the correct location, on time. To meet the demands of the combat commander successfully, the tactical ammunition logistics system must be structured and resourced with the right mix of personnel and equipment to meet mission support requirements.

As the US Army's most recent combat experience in Desert Storm has demonstrated, the munitions distribution system must be structured flexibly and resourced adequately to "throughput" munitions forward on the battlefield.[8] The system must be responsive and capable of providing the munitions necessary to sustain combat power on a battlefield where mobility, flexibility and responsiveness are key to decisive victory.

Section 2: Tactical Ammunition Support Activities

Wartime ammunition distribution at the tactical level of war focuses on the establishment of Ammunition Support Activities (ASA's).[9] ASA's in the tactical wartime ammunition distribution system are the ammunition storage and distribution

links between the strategic and tactical levels of war. Under the MOADS/PLS doctrinal concept, ammunition sustainment at the tactical level is accomplished at three distinct ASA's. Designated as the Corps Support Area (CSA), Ammunition Supply Point (ASP), and Ammunition Transfer Point (ATP), these activities provide the framework for tactical level ammunition support to the warfighting corps and divisions. Within the framework of the ASA's, operating units have been designated and resourced to meet established doctrinal ammunition sustainment mission requirements. MOADS/PLS doctrine designates direct, CSA, and modular support ammunition companies as the operating units for ASA's operating at the tactical level of the WTADS.[10]

By MOADS/PLS doctrinal design, the largest ASA in terms of ammunition received, stored, and issued in the tactical WTADS is the Corps Support Area. Operating to support the high-tonnage ammunition requirements of the warfighting corps, the CSA is established within the corps rear boundaries and serves as the primary link between the strategic and tactical levels of the WTADS. As the primary link between the strategic and tactical WTADS, the CSA under MOADS/PLS doctrine anticipates receiving fifty percent of the ammunition requirements for the corps from the port of debarkation (POD) and the remaining fifty percent from a theater storage activity (TSA) within the operational theater.[11] Serving as a semi-fixed ammunition storage site, the CSA is designed to store an initial corps ammunition stockage objective of ten to fifteen days of supply prior to the outset of combat operations and thereafter, maintain a seven to ten days of supply throughout remaining combat operations.[12] By doctrinal design, the CSA

can exceed forty square kilometers in space, and contain in excess of 25,000 short tons of munitions.

The CSA exists to ensure adequate stockage levels of critical ammunition are available to support the requirements of the wartime commander. Availability of ammunition is therefore dependent on the distribution or flow of munitions from the supplier to the tactical user. To ensure adequate stocks of munitions are available to the user in a timely manner, the CSA pushes forward 100 percent of the ASP's and seventy five percent of the ATP's ammunition requirements.[13] Figure 2-1 illustrates how ammunition flows and the proportion of ammunition resupply received at each ASA under the MOADS/PLS doctrinal concept within a potential theater of operations.

Doctrinal Flow of Munitions Under the MOADS/PLS Concept

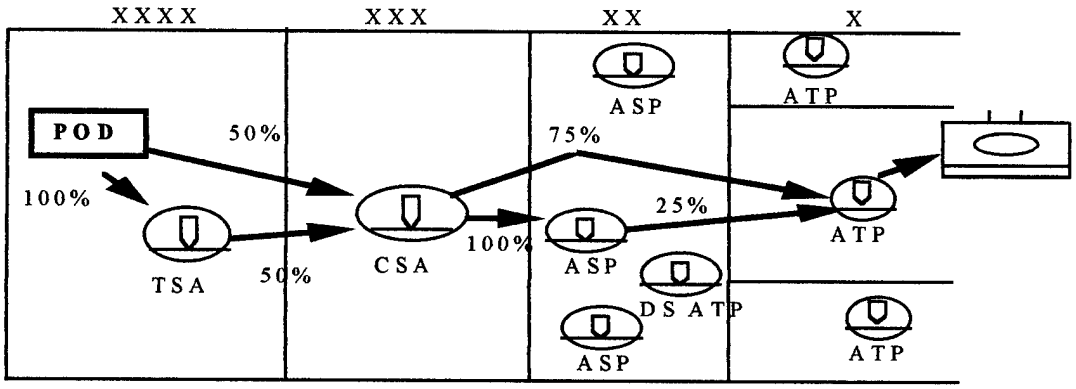

Figure 2-2. The doctrinal flow of munitions in a theater of operations

The primary unit responsible for the daily operation of the CSA under MOADS/PLS doctrine is the MOADS/PLS CSA Ammunition Company (figure 2-2). The MOADS/PLS CSA Ammunition Company is organized and equipped to engage in the receipt, storage, rewarehousing, combat configuration, and issue of conventional

ammunition stocks to their supported corps ASA's utilizing the palletized load system (PLS).

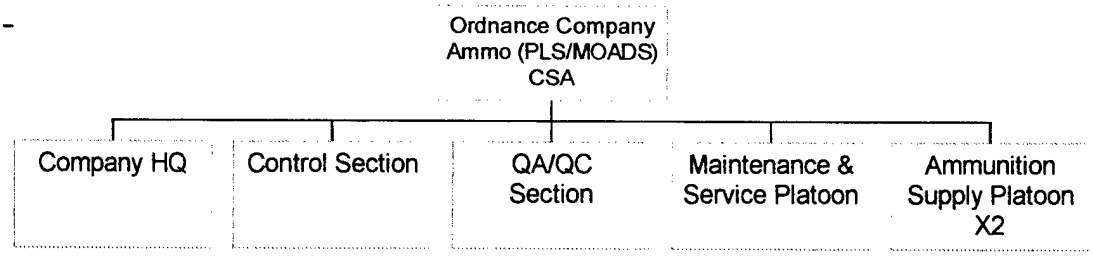

Figure 2-2: Doctrinal Structure of the CSA Ammunition Company under MOADS/PLS [14]

The MOADS/PLS CSA Ammunition Company is assigned to a corps support command (COSCOM). Operating at full capacity, the MOADS/PLS CSA Ammunition Company can receive up to 1,750 STONS of palletized break-bulk and 1,750 STONS of palletized break-bulk ammunition on PLS flat racks from the theater support activity on a daily basis[15] The unit also combat configures and issues on a daily basis, an additional 3,500 STONS of ammunition on PLS flat racks to supported ASP's and ATP's.[16]

To enhance munitions operations support for each combat division on the battlefield, MOADS/PLS doctrine calls for the establishment of up to three geographically dispersed ammunition supply points in each division rear area. Operating as a semi-fixed intermediate ammunition support area in the tactical WTADS, the ammunition supply point (ASP) engages in the receipt, storage, combat configuration and issue of conventional ammunition stockages based on the tactical plan, availability of munitions, and the threat to resupply operations. Existing as a secondary or back-up source of ammunition support to the division, the ASP by doctrinal design can encompass from

five to six square kilometers and store approximately 3,500 short tons of munitions.[17] By MOADS/PLS doctrinal design, the ASP provides twenty five percent of each ATP's daily ammunition requirements and provides ammunition support to non-divisional units operating in the division rear area.[18]

To operate each ASP, MOADS/PLS doctrine calls for a MOADS/PLS DS Ammunition Supply Platoon (figure 2-3). The MOADS/PLS DS ammunition platoons under the MOADS/PLS ammunition company operates up to three ASP's plus an ATP. Each ASP being responsible for supporting one division of a corps.

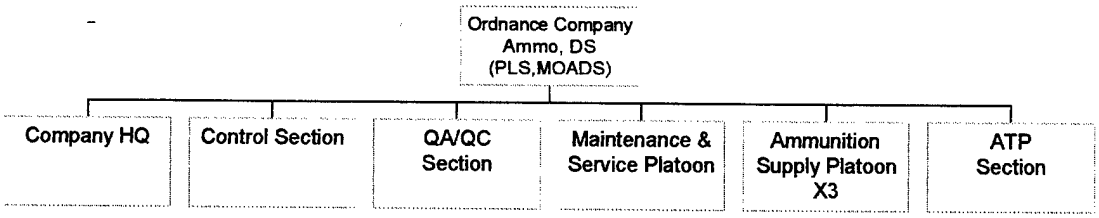

Figure 2-3: Doctrinal Structure of the DS Ammunition Company under MOADS/PLS[19]

The MOADS/PLS DS Ammunition Company is assigned to a corps support command (COSCOM). Operating at full capacity, the MOADS/PLS DS Ammunition Company can receive up to 2,530 STONS at each ASP, with an additional 970 STONS at the ATP on PLS flat racks from the theater support activity on a daily basis.[20]

Operating in direct support of the warfighting brigade on the battlefield, the ammunition transfer point (ATP) is the front line component of the WTADS. Located in each brigade support area (BSA), with an additional ATP at the division support area (DSA), the ATP is considered the most mobile and responsive component of the tactical munitions distribution system. Designed to transload up to 970 STONS of ammunition directly to the wartime user on a daily basis, the ATP provides 100 percent of the

munitions requirements directly to the user.[21] The corps DS ammunition company operates the ATP located in the DSA while each maneuver brigade has a forward support battalion (FSB) that operates an organic ATP in their respective brigade sectors.

As the Army continues it's evolution from a forward-deployed force to one capable of projecting combat power throughout the world, the increased need for flexibility in the ammunition sustainment structure has given birth to the concept of modularity. Instituted as a concept wherein only the required capabilities are deployed to support deployed forces, modularized ammunition operating units have been introduced and integrated into the tactical WTADS.

Under the MOADS/PLS battlefield ammunition distribution force structure, the concept of modularity has been introduced in the formation of Heavy and Medium Lift Platoons.(figure 2-4). Equipped and organized to be both self-sustaining and adaptive to the specific ammunition requirements of a tailored contingency force, modular ammunition sustainment organizations add a new degree of flexibility to the tactical WTADS.[22]

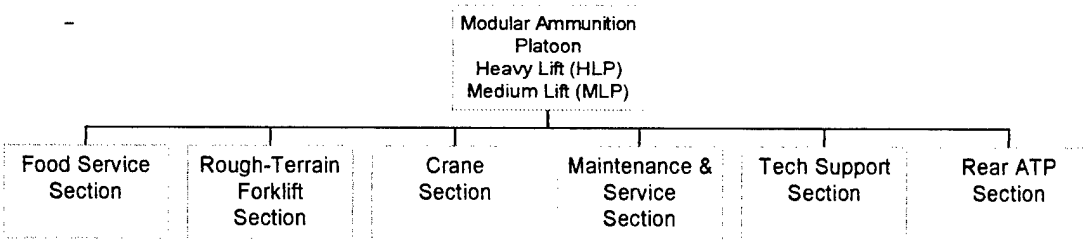

Figure 2-4: Doctrinal Structure of the Modular Heavy & Medium Lift Platoons under MOADS/PLS[23]

Both the ammunition heavy and medium lift platoons, are mobile operating units capable of supporting customer organizations on an area basis. Like the CSA and DS MOADS/PLS ammunition units, the heavy and medium lift platoons accomplish all basic ammunition functions. What differentiates the heavy from the medium lift platoon is the heavy platoon's ability to load and off-load 20-foot containers.

Section 3: Functions

Historically, the primary functions of the tactical WTADS have been the receipt, storage, issue, and control of ammunition from the source activity to the combat user. With the advent of new technology and methods of packaging and distributing ammunition on the battlefield, these traditional roles have been expanded to include the function of ammunition lift and configuration.

Ammunition is received, stored, and issued by operating units assigned to their respective ASA's in accordance with the requirements of the supported wartime commander. The ability to receive, store, and issue the munitions necessary to support decisive combat operations is measured based on the internal lift capability of the ammunition support units operating within the ASA's. Under the MOADS/PLS doctrinal concept, lift is accomplished through a combination of material handling equipment assets and the internal capability of the palletized loading system. Ammunition units capabilities are measured in lift. A lift uses material handling equipment to pick up ammunition and put it down, with each pick up and put down constituting one lift. Lift is measured in short tons, with one short ton equaling 2,000 pounds. All ammunition operating units in the WTADS accomplish a lift function. Operating units strive to

effectively and efficiently manage ammunition lift capabilities to facilitate the maximum movement of ammunition in the shortest given time.

Ammunition is received, stored, and issued under the MOADS/PLS doctrinal concept at each ASA by a number of transportation means in a variety of different configurations. The transportation mode most utilized to throughput large quantities of ammunition within the tactical WTADS historically has been road movement. Ammunition arrives at the tactical ASA's on pallets, flatracks and line-haul trailers. ASA's either store or reconfigure ammunition into combat loads. As ammunition is required to support operations, it is moved forward by a variety of motor transportation assets.

Ammunition received at the ASA comes in two primary configurations as either break bulk or pre-configured cargo. Break bulk ammunition represent single department of defense identification code (DODIC) loads of ammunition and are usually inclusive of munitions that are high tonnage and sustain high usage rates on the battlefield.[24] Configured loads (CL's) consist primarily of ammunition that is low tonnage and high cost that has been packaged in complete round configuration ready for use by the tactical commander.

The receipt, storage, and issue functions of the tactical WTADS exist to ensure adequate stocks of the correct quantities and types of ammunitions are positioned and configured to support the tactical commanders scheme of maneuver. While all ASA's minus the ATP accomplish a storage mission, the CSA is primarily responsible for the configuration of ammunition for onward movement to the user at the tactical level. Ammunition received at the CSA as breakbulk and pre-configured loads is re-configured

into mission configured loads based on the operational scheme of maneuver. Mission - configured loads consist of ammunition stocks packaged in complete round configuration with the intent of providing the user ammunition in a ready to fire status.[25]

Ammunition is issued to the combat user based on a continuous refill system distribution plan to the ATP's and ASP's in the division areas from the CSA. Like all sustainment functions on the battlefield, ammunition is issued and flows based on requirements, priorities, and availability of stocks and transportation assets. To ensure the continuous flow of critical munitions stocks while retaining flexibility and responsiveness in the system, ammunition must be intensively managed and tracked while it is being transported to the combat user.

To control and move ammunition to the combat user, the tactical WTADS is dependent on external controls and transportation. The flow of ammunition in the tactical WTADS is controlled by the ammunition branch of the corps support command material management center. Requirements for ammunition are passed from the using unit to the divisional ammunition officer (DAO) who in turn, requests ammunition resupply from the COSCOM Material Management Center (MMC). The MMC releases ammunition for shipment from the CSA or ASP in accordance with the priorities designated by the corps commander based on constraints imposed by the corps controlled supply rate (CSR).[26]

The automation link used to control ammunition flow in the tactical WTADS is the Standard Army Ammunition System (SAAS). Developed in 1970, the SAAS has been continually modified in order to create a continuous automated link between the strategic

and tactical ammunition support activities of the WTADS. Considered at one time to be one of the worst of all of the automated sustainment systems in the army inventory due to it's processing speed and restraints imposed by peacetime ammunition safety considerations, the SAAS has undergone a major revision with a emphasis on wartime capability.

With improvements instituted in the SAAS-MOD (modernization) process, the processing speed and management functions of the system have been significantly improved.[27] Improvements resulting for the modernization process have significantly enhanced the ability of the system in maintaining asset visibility and accountability of ammunition stocks issued and received at each tactical ASA.

Although not considered a function of the ASA because operating units of the ammunition distribution system are not resourced with the transportation assets required to move significant quantities of ammunition to the using units, the movement of ammunition between ASA's and the ammunition users has a significant impact on the tactical WTADS. Success during combat operations are contingent on the availability of movement assets, i.e. trucks. No matter what foreseeable future contingencies the army will be involved in, trucks will remain the backbone of the distribution process and will be used extensively to move ammunition between ASA's and combat units. The same trucks will also be required to move other supplies besides ammunition. As a scarce resource on the battlefield, the ineffective management of transportation assets will impact substantially on the combat effectiveness of units on the battlefield.

The tactical ASA at the CSA and ASP level cannot function without Corps level transportation assets to move ammunition stocks from ASA's to the using unit. To accomplish the issue and subsequent movement of ammunition on the battlefield under the MOADS/PLS doctrinal concept, doctrine has identified the requirement for a habitual support relationship to exist between Corps MOADS/PLS transportation units and tactical WTADS at the CSA and ASP's. Habitual support relationships within the tactical ammunition distribution system help to identify the movement assets required to flow ammunition for the ASA to the using unit on the battlefield. The transportation assets provided by Corps units are critical to the efficient operation of the WTADS at the tactical level of war. The effectiveness of transportation is dependent on the type of cargo hauled, availability of assets, distance and the varied terrain over which transportation operations are conducted. The impact of habitual support transportation resources on the WTADS will be addressed in Chapter III.

Section 4: Conclusions

Chapter II has focused on looking at the structure of the tactical WTADS under MOADS/PLS doctrine and the critical functions essential to sustaining ammunition support operations on the battlefield. Focusing on the corps CSA, ASP, and ATP, the discussion has detailed how ammunition flows on the battlefield, and who conducts ammunition operations within the tactical WTADS. In assessing the functions of the tactical WTADS, it was discovered that the MOADS/PLS. system is heavily dependent on external support in order to the adequate flow of ammunition on the battlefield.

A review of the structure and functions of the tactical WTADS supports the conclusion that with the institution of the MOADS/PLS. doctrinal structure and the associated concept of modularity, ammunition sustainment support operations on the battlefield have taken significant strides in adapting to the dynamics of the modern battlefield where mobility, flexibility and responsiveness are key to sustaining combat power.

CHAPTER III: CAPABILITIES & LIMITATIONS

"The effectiveness of future military operations will be tied to the CSS capability to project, receive, and support the force"[28]

TRADOC Pam 525-5
Force XXI Operations
1 August 1994

Section I: Introduction

The focus of this chapter is to analyze the capabilities and limitations of the tactical wartime ammunition distribution system as they relate to MOADS/PLS doctrine. The chapter will explore the different capabilities and associated innovations introduced under the MOADS/PLS doctrinal structure that enhance the responsiveness, flexibility, and adaptability of ammunition support operations at the tactical level of war. The capabilities assessed will focus on two fundamental issues associated with building and sustaining combat power. The ability to position and move ammunition forward in a responsive manner consistent with the demands of the wartime commander, and the ability to account for and control the flow of ammunition while maintaining visibility of stocks on the battlefield. By addressing the unique capabilities and limitations associated with MOADS/PLS doctrine in respect to these two fundamental issues, it will be possible to determine how well current doctrine will support the tactical WTADS during future combat operations. The areas chosen for analysis are based on the physical and managerial resources critical to the operation of the tactical WTADS. Physical resources are defined as those assets that facilitate the movement of ammunition. Managerial resources are defined as those assets associated with the control of ammunition during combat operations.

The MOADS/PLS doctrinal concept is currently untested on the modern battlefield. The system has however, been the subject of a number of evaluations by the United States Army Ordnance Missile and Munitions Center and School. Test results from an independent study conducted at Fort Hood, Texas in 1987, were evaluated by the Test and Evaluation Division of the Ordnance Missile and Munitions Center and School. The findings were used to assist in the preparation of the 1998 version of FM 9-6. In the 1987 Ft. Hood evaluation, the capabilities and limitations of the MOADS/PLS ammunition distribution system were studied to determine if the system could provide the required amounts and types of ammunition to the combat user in a timely manner.[29] The findings of the study and combat experience gained during Desert Storm will serve to help illustrate the capabilities and limitations of the MOADS/PLS ammunition distribution system.

Section 2: Physical Resources

Operations during Desert Storm illustrated clearly the enormous quantities of ammunition that could be required to support large scale combat operations. Desert Storm also served to demonstrate the austere environment under which the Army may have to conduct operations in the future. Prior to the start of combat operations during Operation Desert Storm, planners predicted that VII Corps alone would require 450 truckloads (or 9,000 tons) of ammunition a day.[30] To further compound the ammunition distribution problem, the ammunition required to sustain combat operations had to be moved over existing roads consisting mostly of crushed rock and sand for considerable distances. More often than not, this was for distances in excess of 200 miles one way.[31]

The lessons drawn from the Desert Storm example suggest two basic challenges the tactical ammunition distribution system could face in future operations. First, a large number of transportation assets are required to transport the daily ammunition demands of the corps. Second, ammunition will have to traverse difficult terrain for long distances to get ammunition from the supplier to the user. To accomplish these tasks, the ability to deliver ammunition stocks quickly are essential. Under the MOADS/PLS doctrinal design, unique physical resource capabilities assist in making the tactical ammunition distribution system more responsive. These capabilities can be associated with the way ammunition is configured and packaged, positioned on the battlefield, and transported to the using unit.

The way ammunition is packaged and configured significantly enhances the capability of the tactical WTADS in terms of both responsiveness and adaptability. During Operation Desert Storm, a significant proportion of the ammunition delivered to the theater arrived in breakbulk configuration, segregated by individual DODIC's.[32] The ammunition was shipped from the theater support activities to the CSA where it had to be reconfigured based on the requirements of each individual unit. The resulting reconfiguration process put a tremendous strain on the lift assets and personnel assigned to operate the CSA. The requirement to configure significant amounts of ammunition impacted directly on the ability of the ASA to respond rapidly to user demands and often resulted in ammunition being moved forward in breakbulk configuration. When ammunition was moved forward in breakbulk, the user was required to assemble multiple components of ammunition to make a complete round ready for firing. Most affected

were field artillery units, which required extensive material handling equipment and manpower to configure a proper mix or ammunition ready for immediate use on the battlefield. Rearming systems required the individual components of each round to be assembled from different trailers or stocks of grounded munitions by the using unit before they could be ready for use. The amount of material handling equipment and manpower involved in configuring ammunition at the user level, further constrained the ability of the combat commander to rapidly build combat power. To improve responsiveness, it was necessary to reduce the need to configure ammunition at the CSA and eliminate the need for ammunition configuration at the user level.

The ability to reduce the need for configuring ammunition at the tactical level of war depends on the concept of strategic ammunition configuration. Ammunition configuration at the strategic level, coupled with associated improvements in packaging technology, have facilitated the development of schemes for pre-configuring shipments of ammunition, tailored to the user, before ammunition arrives in the theater of operations.[33] At a minimum, the pre-configuration process allows for sub-components of a given round of ammunition to be assembled into balanced loads for a variety of weapons systems. The packaging of ammunition into pre-configured or combat configured loads, provides two significant advantages to the tactical commander under the MOADS/PLS design. First, pre-packaged loads shift material handling efforts rearward and promote an ammunition distribution system that can deliver more munitions faster with less material handling in forward areas. Second, prepackaging

allows for the balanced loads to be assembled easily into a ready to fire configuration that speeds up the ability of the tactical commander to deliver firepower.

The way ammunition is positioned on the battlefield and subsequently, where ammunition is located in relation to the distance between the supplier and user, can further serve to increase the responsiveness of the WTADS. How and where ammunition is stored or grounded on the battlefield has long challenged the flexibility and responsiveness of the tactical ammunition distribution system.[34] During Operation Desert Storm, significant quantities of ammunition often had to be stored at considerable distances from using units. At the onset of offensive operations, the ASAs responsible for storing a majority of the resupply requirements found they did not have the capability to displace rapidly in order to provide responsive support to combat units. Using units were also faced with the problem of grounding ammunition because adequate transportation was unavailable or required elsewhere to support other sustainment functions on the battlefield. While the concept of grounding is often unavoidable, where and how ammunition was stored on the ground during Operation Desert Storm served to limit responsive ammunition operations.[35]

The first problem requiring resolution deals with where ammunition is stored on the battlefield. To resolve the storage problem, the ASAs primarily responsible of the storage of ammunition had to become more mobile. The capability introduced under the MOADS/PLS design to enhance the mobility of ammunition storage units during combat operations lies in the concept of modular logistics.[36] The capability inherent to the modular logistics concept is mobility. Within the tactical ammunition distribution

system, modular logistics is a function of the modular ammunition company. The inherent capability afforded by the modular ammunition company lies in its self-sustaining and rapid displacement ability. The organization of one modular ammunition company allows for individual platoons to establish three separate ASA's closer to using units on the battlefield. By putting ASA's closer to the using unit and making them 100 percent mobile, ammunition support activities can close the distance between ammunition suppliers and users.

The second problem revolved around how ammunition was stored on the battlefield. Ammunition was often grounded during Desert Storm on wooden or metal pallets in an environment hostile to the extensive use of traditional material handling equipment. The grounding of ammunition at multiple storage sites significantly increased manpower and lift requirements. To facilitate the rapid movement of grounded ammunition, it was necessary to eliminate the need to ground ammunition in a configuration that was difficult to move and transload.

The capability associated with the MOADS/PLS concept that addresses the problems encountered with moving and grounding ammunition is the Palletized Loading System (PLS).[37] The PLS is unique in that it offers the WTADS the ability both to lift and move ammunition rapidly due to it's demountable truck bed or flatrack. The specific advantages associated with the PLS system is unique in three ways. First, the flatrack eliminates the need for material handling equipment and additional personnel to load and offload grounded ammunition stocks. Under the operation of one individual, the PLS system is capable of loading and unloading a ammunition flatrack in less than one minute

where previous systems performing the same task required two personnel, material handling equipment, and separate transportation assets which could require up to 2.5 hours loading and unloading time.[38]

The speed and reliability by which ammunition can now be displaced on the battlefield can be attributed to the innovation of the flatrack and its ability to move over unimproved surfaces. The only limitation to the PLS system that has surfaced in testing and evaluation deals with operational availability. Extensive testing of the PLS system in regards to operational availability has concluded that the PLS system is fully mission capable, on average, seventy one percent of the time in a peacetime environment.[39] The primary fault associated with maintenance failure lies in the complexd hydraulic system required to perform the lift of the flatrack. Based on maintenance status reports, it has been concluded that the PLS system can operate approximately 28,137 miles before it will experience a operational mission failure.[40]

The unique capability offered by the pre-configuration process and PLS system significantly improves the responsiveness, flexibility and adaptability of the tactical ammunition distribution process. In fact, unit tonnage capability data suggests that given equal time and local haul distance factors in an austere environment, PLS can deliver over thirty six STONS more ammunition with nine less vehicles than traditional semi-trailer truck assets on a daily basis.[41] For the warfighter, this equates to less vehicles and time required to deliver ammunition from the ASA to the user. Given one field artillery battalion requires 500 STONS of ammunition per day for resupply, nine PLS trucks with a average load capacity of fourteen STONS per vehicle can accomplish what it would

take twelve medium trucks with a thirty four STON load capacity. Of even more significance, is that the same amount of ammunition can be delivered to the user in a ready to fire configuration in half the time required by traditional medium truck assets. Using the predicted requirements anticipated prior to the start of combat operations during Desert Storm of 450 truckloads or 9,000 tons of ammunition a day, utilization of the PLS system could have reduced the daily truck requirements from 450 to 161 trucks per day.

Unit Tonnage Capabilities

	No. Vehicles Available (75% of authorization)	Average STON/Veh Carried Per Trip	No. Trips	Total STONS Cargo Moved Per Day
Medium Truck Company (34-ton trailers)	45	15	2	1,350
Medium Truck Company (22 1/2-ton trailers)	45	22	2	1,980
Medium Truck Company (PLS)	36	14	2	2,016

Figure 3-1[42]

As established through analysis, the physical resource capabilities associated with the MOADS/PLS concept are generally well suited to supporting tactical ammunition operations on a nonlinear battlefield. The physical resources associated with MOADS/PLS have been adequately designed and tailored to meet the ammunition sustainment requirements of a highly mobile, offensive oriented force structure. Although some minor mobility shortfalls have been identified in aspects of rapidly

displacing ASA's and maintenance operability problems associated with the PLS system, the physical resources associated with MOADS/PLS are generally well suited for sustaining offensively oriented combat operations.

Section 3: Managerial Resources

The capabilities and limitations of the tactical WTADS under the MOADS/PLS concept are not concerned solely with the physical resources of the system. In order for the system to function effectively, ammunition distribution must be managed and controlled. Results from PLS concept evaluations, and combat operations during Desert Storm, suggest that the ability to manage and control the flow of ammunition is linked to a fundamental understanding of ammunition operations and the effective use of automation capability.

The Desert Storm experience drove home the fact that the modern battlefield can be enormous in both width and depth. It also amplified the fact that sustaining combat power during highly mobile offensive operations is extremely complex, due to the size, variety, and positioning of units on the battlefield. Even without these conditions, the control of ammunition presents its own specific challenges. Not only did ammunition account for over seventy three percent of the daily sustainment requirements by weight during Desert Storm, but it came in over 400 separate components and varieties of ammunition.[43]

The fundamental management of ammunition on the battlefield is echeloned at different tactical levels in the corps support structure. Within the tactical WTADS, the three primary ammunition managers are the corps material management center (CMMC),

corps movement control center (CMCC), and the division ammunition office (DAO).[44] While all three components retain distinct ammunition management and distribution functions on the battlefield, the tactical ammunition system cannot function effectively without each component having a fundamental understanding of wartime ammunition management and the proper management tools.

The ability to control ammunition flow starts with trained personnel who understand the link between ammunition management and movement. Under current ammunition sustainment doctrine, WTADS management is fragmented between those whom control and those whom move ammunition. Because ammunition control and movement activities are separate, the time associated with making the decision to move ammunition and the actual movement process can be lengthy. The 1987 Ft. Hood evaluation of the PLS system clearly detailed the continual problems associated with the lack of effective coordination between the control and movement aspects of the WTADS.[45] On a number of occasions throughout the evaluation, it was found that due to a lack of coordination and a general misunderstanding of movement priorities, ammunition shipments were delayed or even missed. Fundamental errors in control that could have had a significant impact on wartime commanders' ability to build and sustain combat power on the battlefield.

Another example of the fundamental lack of understanding associated with ammunition management is the area of ammunition forecasting. Ammunition forecasting is based on historical ammunition consumption rates. Consumption figures are based on the anticipated intensity of combat operations and is measured in daily

requirements Many of the overages and shortages of ammunition experienced during Desert Storm and MOADS/PLS testing had roots in the ammunition forecasting process. Findings suggest that the ability to accurately forecast ammunition is limited in two aspects. First, ammunition managers, in the absence of actual consumption data, often prepare for anticipated combat operations by using predetermined ammunition consumption rates. These consumption rates are based primarily on previous combat consumption figures and, there is debate throughout the Army as to what are the correct "rates". Second, shortfalls or system problems, either real or perceived, cause using units to over order ammunition.

While shortages of ammunition could have a significant impact on combat operations, it is the overages on the battlefield that limit the flexibility and responsiveness of the tactical ammunition distribution system. If for example, one unit orders more ammunition than required, the potential exists for other units to be shorted critical ammunition stocks.. There is also the issue of moving the extra ammunition to the wrong place on the battlefield with already constrained transportation assets. Although the PLS system has enhanced the ability to ground and move ammunition, it is likely that the number of PLS systems on the battlefield will be limited. To further compound the problem, the constant movement of ammunition often leads to accountability issues and a loss of asset visibility.

The accountability of ammunition either on or off the battlefield, has always proven challenging. To perform ammunition accountability functions and maintain visibility of ammunition stocks during combat operations, the Army utilizes the Standard Army

Ammunition System (SAAS). Developed in 1970, and tested under combat conditions during Desert Storm, SAAS is the automated system designated to account for both training and wartime ammunition stocks.[46] Because the system has a peacetime focus, some of its functions were found to be unsuitable for wartime operations.

The foremost of the SAAS system problems lie in it's inability to process data rapidly. SAAS as originally designed, contains safety control measures relevant only to peacetime operations. When utilized during combat operations in Desert Storm, the peacetime control processes caused the system to slow down and on occasion, crash. Because SAAS was designed as a "stovepipe" system, it was discovered quickly that it was incapable of interfacing with other automated systems.[47] The only redundant capability came in the form of manual recordkeeping, and off-the-shelf software programs created by ammunition managers. It was also discovered that communication assets that could handle data transmissions between SAAS computers were limited. These factors coupled with the slow speed of data transmissions rendered the SAAS system incapable of tracking ammunition in real time on the battlefield.

Management control functions, as they exist in the tactical WTADS, limit the ability to control what ammunition moves and where it flows based on the priority of need, and therefore limit the responsiveness and flexibility of the current tactical ammunition distribution system. While the limitations associated with the SAAS system are currently undergoing study and modification, the current SAAS system is slow and has limited visibility of ammunition stocks on the battlefield. Significant limitations also exist in the

areas of forecasting and in the consolidation of ammunition management and movement functions that can only be resolved through change.

Section 4: Conclusions

This chapter has addressed the limitations and capabilities of the tactical ammunition distribution system under the MOADS/PLS doctrinal concept in terms of physical and managerial resources. The conclusion drawn from the analysis is that the current WTADS at the tactical level of war can be changed or modified to improve the effectiveness of the tactical ammunition distribution system.

As the army continues to prepare for combat operations in the future, there can be little doubt that ammunition sustainment operations will continue to be both challenging and complex. The necessity of meeting the ammunition demands associated with new technology and, the way battles and engagements will be fought in the future, will force doctrine writers to anticipate ways in which the physical and managerial resources associated with the tactical ammunition distribution system will have to adapt and change. Changes that should serve to generate the combat power necessary to sustain decisive combat operations and enhance combat effectiveness on the modern battlefield.

CHAPTER IV: IMPROVING EFFECTIVENESS

"The ammunition support structure is evolving. In the near future, and well into the twenty-first century, ammunition units will become smaller and more flexible and capable of deploying more."[48]

FM 9-6
Munitions Support in the Theater of Operations
20 March 1998

Section 1: Introduction

The perceived limitations of the tactical WTADS as detailed in Chapter III, suggest that change and innovation could improve the timely and accurate distribution of ammunition on the future battlefield. Since inception, the WTADS has been faced with one historical problem: How to modify, improve, and adapt the current system to satisfy estimated wartime requirements in a environment where technology and the way battles and engagements are fought change constantly.

In retrospect, the PLS/MOADS ammunition distribution design at the tactical level of war offers many unique capabilities to the timely support of deep operations. Concepts and resources focusing on the ability to move large quantities of ammunition forward rapidly, to sustain deep maneuver operations, provide the requisite operating characteristics essential to enhancing responsive ammunition support on the battlefield. The PLS/MOADS ammunition distribution system is in fact more productive and responsive than previous ammunition distribution systems and has proven that it saves manpower spaces and material handling equipment across the ammunition support force structure.[49] In short, the PLS/MOADS ammunition distribution concept has merit for future ammunition distribution operations at the tactical level of war.

Even so, one cannot rule out the possibility that alternatives solutions relating to the employment of current capabilities could be implemented to improve the effectiveness and efficiency of the current MOADS/PLS ammunition distribution system. This chapter offers solutions that could serve to better adapt and integrate the ammunition systems' ability to support the operational commanders intent in order to generate and sustain combat power on the future battlefield.

Section 2: Restructuring

How ammunition flows and where it is positioned on the battlefield has a significant impact on the responsiveness of the ammunition distribution system. Using the unit method of distribution based on the 100 percent delivery of ammunition to the combat unit, versus having units return to the ASA, significantly improves the overall responsiveness of the system.[50] The issue therefore is not the theory behind the concept, but the reality that in supporting deep operations, the distance between ASA's and ammunition users must be reduced to increase responsiveness.

One answer lies in restructuring the ASP, and positioning it closer to the using combat units. This solution, while not new with the introduction of modular support units into the sustainment structure, has not been explored to it's full potential. Under the current MOADS/PLS doctrinal concept, 100 percent of the ammunition for combat units in the theater flows from theater activities to the CSA. At the CSA, ammunition is configured and shipped to the forward ASP's and ATP's in the division and brigade areas with seventy five percent of the ammunition requirements being provided to the ATP's, and 100 percent provided to the ASP's by the CSA.[51]

The proposed concept change focuses on reorganizing the ASP structure as currently outline in MOADS/PLS doctrine to create mini-ASP's. To make the concept work, the ASP structure as proposed in MOADS/PLS doctrine needs to be refined. First, ASP's need to be smaller and focus on storing critical ammunition items required to support the tactical commander. Second, the ammunition supply platoons in the MOADS/PLS DS ammunition company need to be replaced with modular ammunition platoons or, DS ammunition companies need to become modular ammunition companies.

This change has both advantages and disadvantages in terms of increasing the responsiveness and capabilities of the tactical ammunition distribution system. The primary advantages are twofold. First, by making the ASP structure smaller, the signature and size of the facility decreases detection by the enemy and the mobile capability of the organization increases dramatically. Under current MOADS/PLS doctrine, the ASP is designated as a semi-fixed storage facility. This translates to a limited capability to move rapidly from one location to another due to the amount of ammunition that could be potentially stored on the ground at the facility. By creating mini-ASP's, the system increases flexibility for the customer through it's capability to keep pace with the sustainment requirements associated with highly mobile deep operations. Second, by replacing existing ammunition supply platoons with modular platoons, mobility is increased and internal sustainment support is organic when the platoon is separated from the parent unit. Because the unit has a organic sustainment capability, more modular platoons can be assigned to one ammunition company and thus increase the number of ASP's that can be established in a division sector.

The primary disadvantages of the concept relate to the movement and control of ammunition from the CSA to the respective mini-ASP's and ATP's. By increasing the number of ASP's on the battlefield, the requirements associated with servicing multiple ammunition sites adds stress to a potentially overburdened transportation system. There is also the additional burden of controlling how much and what types of ammunition flow to each site.

After review of the capabilities associated with the current MOADS/PLS structure, this concept is both feasible and practical based on the following facts. First, the combat configuration and use of PLS flatracks provides the capability to move a high tonnage of ammunition rapidly on the battlefield, and allows for the grounding of ammunition in a configuration that is easily loaded/unloaded in a short period of time. Second, The MOADS/PLS system allows for the movement of ammunition forward to the user directly from the CSA during surge ammunition consumption periods and eliminates the requirement to position large quantities of ammunition forward to support deep operations. Third, the use of radio frequency tags and other automated means of tracking combat configured loads in real time adds a new dimension to the visibility of ammunition on the battlefield.[52] Improvements in communication means, now allow for ammunition shipments in route to be diverted based on usage requirements.

Section 3: Automation

The U.S. Army is now and will continue to be in the future, heavily dependent on automation to conduct decisive combat operations. The ammunition sustainment system is no different in respect to its heavy dependence on automation to sustain combat

operations. As technology speeds up the pace of operations on the battlefield, the ammunition sustainment automation system must continue to keep pace. Even so, ammunition sustainment cannot rely completely on technology to meet the demands of combat. Personnel operating the system must have the ability to make the sustainment system work manually.

The Standard Army Ammunition System (SAAS) has gone through a number of growing pains in the attempt to retain the ability to support ammunition operations in combat. The system has been modified continually to shift it's focus from peace to wartime operations. SAAS, with it's current modifications designed to enhance ammunition distribution processes at all levels throughout the WTADS, is still evolving.[53]

To improve the responsiveness of the ammunition distribution system, the SAAS system must be streamlined and made inter-operable with other sustainment systems on the battlefield. To date, the system still does not have the full capability to interface rapidly with other automated combat service support essential to ammunition sustainment operations and it is prone to crash under extreme environmental conditions.

It is time to replace the current SAAS system in favor of one capable of meeting all the demands associated with future ammunition sustainment operations on the battlefield. SAAS cannot survive as a stand alone system in a environment dependent on the sharing of information. The inability of any system to adapt to the rapid information requirements demanded by the potential pace of future combat operations could put the

force at unnecessary risk. Unnecessary risk is also associated with the inability of personnel to understand how to manage the ammunition distribution process manually.

The solution can be found in existing commercial automation programs which can be adapted at low cost to the Army's current computer inventory. The ability to transmit data rapidly to multiple locations is already in existence within the Army force structure in the Combat Service Support Communication System. With additional testing and application, this current system can be adapted to ammunition sustainment functions. Every effort must also be made to teach both manual and automated ammunition operations as they pertain to ammunition operations. The advantages are twofold. First, by merging automated ammunition sustainment functions with current systems, the system can be refined and streamlined. This could not only speed up the transmission of data, but add a new dimension of flexibility to the system. Second, by integrating with existing systems, ammunition sustainment activities can more readily share information with other sustainment activities. Third, by preparing personnel to in both automated and manual sustainment management activities, redundancy is maintained within the system.

Section 4: Training

The final proposal offered to improve the capability and responsiveness of the tactical WTADS does not concern itself with equipment or doctrinal revisions, but focuses on the human dimension of ammunition sustainment operations as they relate to training. Realistic training in the warfighting sustainment skills necessary to implement MOADS/PLS doctrine is essential to generating and sustaining combat power. As the MOADS/PLS system has not been stressed during combat operations, many questions

remain unanswered in relation to how the system will meet the demand associated with armed conflict. How well the system functions, or fails to function, will be heavily dependent on the interaction and preparation of personnel associated with ammunition sustainment activities on the battlefield.

The proposal is simple. Combat arms, ordnance, and transportation units must understand how ammunition sustainment operations work, and must train together habitually for wartime Class V operations in a realistic training environment. Organizations must prepare to fight as integrated, combined arms teams.

Studies of training exercises conducted during exercises at the National Training Center (NTC) suggest that there is a general lack of knowledge in understanding how ammunition sustainment works during replicated combat situations.[54] Often, the lack of understanding results in too much ammunition requested by the using unit. The resulting "overage" has a direct impact on the system in two respects. First, potentially critical stores of ammunition become unavailable for use by other organizations. Second, the requirement to move excess ammunition burdens the transportation system or results in ammunition having to be "grounded". The process of "grounding" ammunition in itself creates problems with ammunition accountability and security.

Simulated combat training exercises have also concluded that a coordination problem exists between the ordnance and transportation communities in the ability to communicate the need for ammunition transportation requirements. An inadequate understanding of mission requirements coupled with a perceived lack of interpersonal communications skills, often led to bottlenecks and a failure to deliver the required

ammunition stocks to the user in a timely manner consistent with the scheme of maneuver. Problems that could have been solved if priorities had been communicated clearly and the tactical intent of the ammunition user understood.

To resolve the problems encountered during simulated combat operations and to better prepare for future combat operations, a clear understanding of the tactical commander's intent must be understood and support priorities established. In retrospect, intent must be translated and linked into all aspects of ammunition sustainment. A linkage that is best established through the integration and sharing of information between the those who control and move ammunition on the battlefield.

Section 5: Conclusions

In conclusion, the PLS/MOADS ammunition distribution system design at the tactical level of war offers a number of unique capabilities that enhance the flow of ammunition on the battlefield. The system has proven under simulated combat conditions that it saves manpower spaces and reduces the amount of material handling necessary to support the current force structure. Even with these improvements, the possibility remains that the tactical ammunition distribution system can be improved if further modified and adapted to meeting the ammunition sustainment anticipated on the future battlefield.

By reassessing who handles ammunition and where it is positioned on the future battlefield, it is feasible that the flow of ammunition to the user can be enhanced. This, coupled with improved automation capability, realistic training, and the integration of control measures at each level of ammunition management will further enable the

ammunition sustainment operations to keep pace with future operations. Future combat operations will demand ammunition sustainment activities capable of meeting the diverse logistics requirements associated with sustained operations in a variety of combat environments.

CHAPTER V: CONCLUSION

This paper sought to answer the primary research question; can the corps ammunition distribution system be modified to enhance combat effectiveness on the battlefield? The focus of the research centered on the systematic assessment of the capabilities and limitations of the MOADS/PLS doctrinal design in order to site areas where improvements or modification to the existing tactical ammunition distribution system could enhance combat effectiveness.

The review of the current structure and critical functions of the WTADS revealed a robust sustainment support structure focused on responsiveness and flexibility. The structure and functions are designed to ensure the right quantities and types of ammunition are available to support the requirements of the tactical commander in a manner consistent with the scheme of maneuver. Most notable in terms of enhancing responsiveness and flexibility in the structure was the introduction of the modularity sustainment support concept for future operations. The introduction of the Modular Ammunition Company and its associated capabilities has added a new dimension to ammunition support tailored to meet the demands associated with force projection operations.

The assessment continued with a review of the limitations and capabilities of the tactical ammunition distribution system under the MOADS/PLS doctrinal design. The focus of the analysis centered on the unique physical resources and control measures associated with ammunition distribution operations under MOADS/PLS.

The analysis of physical resources concludes that how ammunition is packaged and moved on the battlefield under MOADS/PLS is significantly enhanced by the introduction of the PLS truck and associated flatrack. The PLS system and associated innovations in the way ammunition is packaged, adds a new dimension of flexibility and responsiveness to ammunition distribution at the tactical level of war. Flexibility and responsiveness that equates to the rapid movement of ammunition in a ready to fire configuration.

A review and analysis of the control measures associated with ammunition distribution at the tactical level of war uncovered a number of limitations which could potentially have an impact on the ability of the system to sustain combat power. First, it was discovered that the automation means utilized for wartime ammunition distribution and accountability (SAAS), was lacking in many respects. SAAS, as currently configured and designed, needs modification and enhanced capability which will allow for better and more responsive tracking of ammunition on the battlefield. Second, ammunition distribution control functions are unclear and fragmented between those who account for and those who move ammunition on the battlefield.

The final chapter of the paper focused on suggestions relating to how the corps ammunition distribution system can be changed of modified to enhance combat effectiveness on the battlefield. The discussion recommends three areas in which the current ammunition distribution system needs to be changed or improved to better support the timely and accurate distribution of ammunition on the battlefield. First, the structure of the ammunition distribution system should be further modified to make

better use of existing PLS capabilities. Second, ammunition functions must be consolidated and the automation aspect of ammunition management must be refined to provide both accurate and timely data on the battlefield. Third, more integrated, realistic training is required for people who deal with ammunition on the battlefield in order for them to gain a understanding of how the system should and does work.

The answer to the primary research question based on the analysis and insight gained from this study of the current wartime ammunition distribution system is yes. The corps ammunition distribution system can be modified to enhance combat effectiveness on the battlefield. In retrospect, the current tactical ammunition distribution system as structured under MOADS/PLS is doctrinally sound and has the capability of supporting the U.S. Army's currently anticipated force projection ammunition requirements in the foreseeable future. What is of primary concern deals with the future. Combat operations have evolved in the post-Cold War era and will continue to evolve in the future. Success on the battlefield will depend on the ability of the force to generate and sustain combat power. To generate the required combat power, sustainment systems, like the ammunition distribution system, must evolve, change, and adapt to the combat environments the U.S. Army will surely face in the future.

ENDNOTES

[1] Quoted from LTG Joseph M. Heiser's remarks at the HELFAST XVIII Conference, Fall 1986. The saying may well have originated with another source.

[2] "Arming the force" describes the sustainment process utilized to provide ammunition to units during combat operations. The process is outlined in U.S. Army Field Manual 63-3, Corps Support Command, (Washington D.C.: U.S. Government Printing Office, 1993), Chapter 5.

[3] U.S. Army Field Manual 9-6, Munitions Support in the Theater of Operations, (Washington D.C.: U.S. Government Printing Office, 1998), is the basic reference for ammunition operations under the MOADS/PLS doctrinal concept.

[4] Ibid., 2-13.

[5] Ibid., 1-4.

[6] U.S. Army Field Manual 100-5, Operations, (Washington D.C.: U.S. Government Printing Office, 1993), 2-6 to 2-9, lists the tenants of Army Operations Doctrine as; initiative, agility, depth, synchronization, and versatility.

[7] U.S. Army Field Manual 9-6, Munitions Support in the Theater of Operations, 1998, 1-2.

[8] U.S. Army Field Manual 63-3, Corps Support Command, 1993, 1-16, defines throughput as a method of supply distribution wherein an intermediate supply source is bypassed in order to provide more efficient support.

[9] U.S. Army Field Manual 9-6, Munitions Support in the Theater of Operations, 1998, 1-7, promotes the idea that ASA structures must vary in size and capability based on projected mission requirements. What is constant are the functions and missions performed.

[10] Ibid., Ammunition doctrine uses the term operating units to designate the personnel and equipment required to support the functions of the various tactical ASA's.

[11] Ibid., 2-2.

[12] U.S. Army Field Manual 9-38, Conventional Ammunition Unit Operations, (Washington D.C.: U.S. Government Printing Office, 1993), p. 2-5, designates a semi-fixed storage site as one that consists of storage structures that contain ammunition. In a tactical environment, the site can be moved as ammunition units move on the battlefield.

[13] U.S. Army Field Manual 9-6, Munitions Support in the Theater of Operations, 1998, 2-2.

[14] Ibid., 2-10

[15] Ibid., 2-10. The PLS system consists of three components: a truck configured with or without a material handling crane; a trailer; and a removable cargo bed, generally referred to as a flatrack.

[16] Ibid., 2-10.

[17] Ibid., 2-12.

[18] Ibid., 2-4.

[19] Ibid., 2-12

[20] Ibid., 2-12.

[21] Ibid., 2-4.

[22] Ibid., 2-13. Under the modularity concept, only the required number of support equipment and personnel are deployed to support ammunition sustainment operations. The modularity concept calls for support packages to be built based on anticipated sustainment requirements.

[23] Ibid., 2-16. The crane section is organic only to the heavy lift platoon.

[24] Ibid., 2-2.. All ammunition components have a Department of Defense Identification Code (DODIC) which is used to identify each component of ammunition.

[25] Ammunition is deemed to be in a ready to fire configuration when it has all the DODIC components of the individual round assembled and ready for immediate launch.

[26] U.S. Army Field Manual 63-3, Corps Support Command, 1993, 5-2. The controlled supply rate (CSR) identifies those DODIC's of ammunition whose consumption are restricted due to shortages or mission priorities. The imposing authority for a CSR is usually reserved for the corps commander in the tactical WTADS.

[27] Howard M. Barrett, "Standard Army Ammunition System Modernization (SAAS-MOD)", (Ft. Lee, VA: 1998), 1.

[28] United States Army Training and Doctrine Command, TRADOC PAMPHLET 525-5, Force XXI Operations, (Fort Monroe, VA: 1994), 1-1.

[29] Independent Evaluation Report on the Palletized Load System (PLS) Ammunition Distribution System (ADS) Force Development Test and Experimentation, 14 May 1987, iii.

[30] Terry L. Niehhouse, "Ammunition: A Vital Ingredient in Strategic Logistics", (Carlisle Barracks, PA. US Army War College, 1992), 4.

[31] Ibid., 3. A number of logistics bases were established along main supply routes within the theater of operations. The distances between the bases varied based on the tactical scheme of maneuver.

[32] Ibid., 2.

[33] Brian E. Leverich, "Increasing Combat Capability Through Enhancing the Responsiveness of Wartime Ammunition Logistics: Measurement Methodology, Case Studies, and Policy Implications" (Ann Arbor, MI: Rand, 1990), 14.

[34] Ibid., 21. Grounding ammunition is a term used primarily by the ammunition user. Ammunition is usually grounded by the using unit in combat when the unit has to displace and the amount of ammunition at the using unit exceeds organic lift capability.

[35] Niehhouse, "Ammunition: A Vital Ingredient in Strategic Logistics," 5.

[36] U.S. Army Field Manual 100-7, Decisive Force: The Army in Theater Operations, (Washington, D.C.: U.S. Government Printing Office, 1995), A-24.

[37] Leverich, "Increasing Combat Capability Through Enhancing the Responsiveness of Wartime Ammunition Logistics: Measurement Methodology, Case Studies, and Policy Implications," 1990, 21. The PLS consists of three components: a truck configured with or without a material handling crane; a trailer; and a removable cargo bed, generally referred to as a flatrack.

[38] Student Text 101-6, G1/G4 Battle Book, 1997, 1-11.

[39] Department of Transportation Annual Report, Palletized Load System (PLS), (Washington, D.C.: U.S. Government Printing Office, 1996), 1

[40] Ibid., 1.

[41] Student Text 101-6, G1/G4 Battle Book, 1997, 1-15. Transportation is calculated based on distance, rate, and time. Local haul is a distance factor that equates for planning purposes to 20 miles one way per trip.

[42] Ibid., 1-15.

[43] Desmond Saunders-Newton, "Battlefield Ammunition Distribution: The Role of Systemic Adaptation in Dynamic Environments", (Ann Arbor, MI: Rand, 1993), 6.

[44] U.S. Army Field Manual 9-6, Munitions Support in the Theater of Operations, 1998, 2-23.

[45] Independent Evaluation Report on the Palletized Load System (PLS) Ammunition Distribution System (ADS) Force Development Test and Experimentation, 14 May 1987, 9.

[46] Barrett, "Standard Army Ammunition System Modernization (SAAS-MOD)", 1998, 2.

[47] Ibid., 2. The term stovepipe implies that the SAAS system has inherent difficulties in linking data transmission to other sustainment systems. SAAS-MOD proposes to eliminate the communications link problem.

[48] U.S. Army Field Manual 9-6, Munitions Support in the Theater of Operations, 1998, 2-4.

[49] Independent Evaluation Report on the Palletized Load System (PLS) Ammunition Distribution System (ADS) Force Development Test and Experimentation, 14 May 1987, iii.

[50] U.S. Army Field Manual 63-3, Corps Support Command, 1993, 1-16.

[51] U.S. Army Field Manual 9-6, Munitions Support in the Theater of Operations, 1998, 2-2.

[52] Barrett, "Standard Army Ammunition System Modernization (SAAS-MOD)", 1998, 2.

[53] Ibid., 2. The evolutionary process of SAAS is SAAS-MOD.

[54] Independent Evaluation Report on the Palletized Load System (PLS) Ammunition Distribution System (ADS) Force Development Test and Experimentation, 14 May 1987, C-1. The comments relating to the NTC emphasize a need for more realistic ammunition handling operations and the accomplishment of tasks against realistic time standards.

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